

I CLAIM AS MY INVENTION:

1. An elongated, compact cutting element for use in cutting a nonductile material, the element comprising,

a contact structure formed at a distal end of the cutting element for engaging said material,

a tapered structure adjacent said contact structure,

a circumferentially engageable portion spaced from the contact structure, and

a threadably engageable mounting structure at the opposite end of the cutting element from the contact structure,

wherein at least a portion of the contact structure is harder than 67 on the Rockwell C scale.

2. A cutting element as defined in claim 1, wherein at least a portion of said contact structure is fabricated from one of a group of materials comprising diamond, a nitride of a metallic element, a carbide of a metallic element, an oxide of a metallic element carbide, a boride of at least one metallic element, a silicide of a metallic element, and carbon nitride.

3. A cutting element as defined in claim 2, wherein said contact structure is attached to the tapered structure by welding, sintering or brazing.

4. A cutting element as defined in claim 1, wherein said threadably engageable mounting structure comprises a tapered thread.

5. A cutting element as defined in claim 1, wherein said mounting structure is formed from a ferrous material.

6. A cutting element as defined in claim 1, wherein the circumferentially engageable structure is located between the contact structure and the proximal end.

7. A cutting element as defined in claim 6, wherein said engageable structure projects radially of the cutting element slightly outwardly of said contact structure.

8. A cutting element as defined in claim 1, wherein at least a portion of said contact structure comprises a polycrystalline material and said material has hardness greater than about 92 on the Rockwell A Scale.

9. A cutting element as defined in claim 8, wherein said polycrystalline material comprises at least in part a material selected from the group comprising diamond, a nitride of a metallic element, a carbide of a metallic element, an oxide of a metallic element, a carbide of a metallic element, a boride of at least one metallic element, a silicide of a metallic element, and carbon nitride.

10. A cutting element as defined in claim 1, wherein the included angle of the tapered section at a center of the contact structure is greater than about 90 degrees and less than about 150 degrees.

11. A compact, elongated cutting element for cutting nonductile materials, the cutting element comprising:

a generally pointed distal end structure,

a mounting structure carrying the distal end structure and a holding structure,

an axially engageable feature on the mounting structure spaced from the end structure, and

a proximal end opposite the end structure,

wherein at least a portion of the distal end structure is harder than 68 on the Rockwell C scale, and wherein the total length of the cutting element divided by a largest diameter of the holding structure is less than 3.25.

12. A cutting element as defined in claim 11, further comprising a contact structure axially aligned with and attached to the holding structure.

13. A cutting element as defined in claim 12, wherein at least a portion of the contact structure comprises in part one of a group comprising diamond, a nitride of a metallic element, a carbide of a metallic element, an oxide of a metallic element carbide, a boride of at least one metallic element, a silicide of a metallic element, and carbon nitride.

14. A cutting element as defined in claim 13, wherein the contact structure is attached to the mounting structure by one of welding, sintering, and brazing.

15. A cutting element as defined in claim 12, wherein the cutting element is generally radially symmetric about a central axis of the element.

16. A cutting element as defined in claim 12, further comprising an axially engageable structure.

17. A cutting element as defined in claim 16, wherein said axially engageable structure is a generally circular groove formed in the mounting structure.

5 18. A cutting element as defined in claim 16, further comprising a second axially engageable structure spaced from the first on the mounting structure.

19. A cutting element as defined in claim 17, wherein the second axially engageable structure is a groove or recess formed in the mounting structure.

10 20. A cutting element as defined in claim 11 wherein the total length of the cutting element divided by a largest diameter of the holding structure is less than 3.00.

21. A cutting element as defined in claim 20, further comprising a contact structure axially aligned with and attached to the mounting structure.

22. A cutting element as defined in claim 21, wherein at least a portion of the contact structure comprises in part one of a group comprising diamond, a nitride of a metallic element, a carbide of a metallic element, an oxide of a metallic element carbide, a boride of at least one metallic element, a silicide of a metallic element, and carbon nitride.

23. A cutting element as defined in claim 22, wherein the contact structure is attached to the mounting structure by one of welding, sintering, and brazing.

20 24. A cutting element as defined in claim 21, wherein the cutting element is generally radially symmetric about a central axis of the element.

25. A cutting element as defined in claim 21, further comprising an axially engageable structure.

26. A cutting element as defined in claim 21, wherein said axially engageable structure is a generally circular groove formed in the mounting structure.

25 27. A cutting element as defined in claim 21, further comprising a second axially engageable structure spaced from the first on the mounting structure.

28. A cutting element as defined in claim 27, wherein the second axially engageable structure is a groove or recess formed in the mounting structure.

29. A cutting element as defined in claim 28, wherein the second axially engageable structure is a projecting structure formed in the mounting structure.

30. A cutting element as defined in claim 29, wherein the second axially engageable structure is a circular ledge formed in the mounting structure.

31. A cutting element for cutting brittle materials, the cutting element comprising:
a contact structure comprised of a first material,
a generally tapered shoulder adjacent said contact structure, the shoulder comprised of a
second material, and wherein
the hardness of the second material is at least 1000 points on the Vickers scale, and
the hardness of the first material is at least 300 points harder on the Vickers scale than the
second material.

32. A cutting element as defined in claim 31, wherein the contact structure is formed as a column.

33. A cutting element as defined in claim 32, wherein the cross sectional area of the column of material is less than about 10 percent of the largest cross-sectional area of the shoulder of the cutting element.

34. A cutting element as defined in claim 33, further comprising a support structure for the contact structure.

35. A cutting element as defined in claim 34, wherein a mounting body adjoins the proximal end of said mounting structure.

36. A cutting element as defined in claim 34, wherein said contact structure is attached to the mounting body by one of welding, sintering, and brazing.

38. A cutting element as defined in claim 36, wherein the proximal end of said mounting portion is threaded.

39. A cutting element as defined in claim 38, wherein said threaded element comprises a tapered thread.

40. A cutting element as defined in claim 36, wherein said mounting portion is fabricated of a ferrous material.

5 41. A cutting element as defined in claim 36, wherein at least one non-circular, circumferentially engageable structure is located between the contact structure and the proximal end.

42. A cutting element as defined in claim 41, wherein said engageable structure projects radially slightly beyond said shoulder.

10 43. A cutting element as defined in claim 41, wherein the engageable structure has a hexagonal cross section.

44. A cutting element as defined in claim 43, further comprising an axially engageable structure formed in the mounting structure.

15 45. A cutting element as defined in claim 44, wherein said axially engageable structure is a groove.

46. A cutting element as defined in claim 45, further comprising a second axially engageable structure formed in the mounting structure, spaced to the proximal end from the first.

47. A cutting element as defined in claim 46, wherein the second axially engageable structure is a groove.

20 48. A cutting element as defined in claim 46, wherein the second axially engageable structure is a projecting structure.

49. A cutting element as defined in claim 48, wherein the second axially engageable structure is a ledge.

25 50. A cutting element as defined in claim 47, wherein the mounting body has approximately the same diameter as the balance of the cutting element.